

**STANDARD  
FOR  
DETENTION STRUCTURES  
FOR CONTROL OF DOWNSTREAM EROSION**

Definition

A structure providing for temporary storage of stormwater runoff and its controlled release.

Structures created by construction of dams or barriers are referred to as "Embankment Structures" and those constructed by excavation as "Excavated Structures." Structures resulting from both excavation and embankment construction are classified as "Embankment Structures" where the depth of water impounded against the embankment at the emergency spillway elevation is 3 feet or more. Other forms of detention are also addressed in this standard such as rooftop and parking lot storage and underground detention systems.

Scope

This standard covers the installation of all detention, and infiltration / retention structures (those which retain a permanent pool of water below the design storm storage volume elevation).

Purpose

Detention structures are an available option to reduce erosion damages downstream by controlling the release from flows of predetermined frequencies. They may also permit the use of more economical channel improvements or stabilizing structures in the channel downstream and reduce environmental hazards and pollution.

Conditions Where Practice Applies

This practice applies if there is a potential for increased downstream erosion due to construction at development sites or from other land use changes or if local ordinances require storm detention structures. In general the practice applies to reducing the post development peak flows to 50% and 75% of predevelopment peak flows for the 2 and 10 year storms, respectively. The increased downstream erosion may be caused by increased runoff volume and/or increased peak discharge. If the detention structure is also intended to comply with the provisions of the Stormwater Management Act of 1981 or any revisions thereto, regulations promulgated by DEP pursuant to that Act shall apply.

Where infiltration structures are proposed a stable condition at the emergency discharge area must be provided. An offsite stability analysis must be conducted in accordance with the Standard for Offsite Stability which assumes that the infiltration component is non-functional due to failure. The analysis shall demonstrate that the peak discharge of the 10 year storm event is not reduced by infiltration and that stability requirements are met.

Water Quality Enhancement

The use of a detention structure to control stormwater runoff may have several beneficial effects on water quality. First and foremost, control of small event storms will help prevent downstream erosion. Larger storms are managed to mitigate against flooding. By virtue of their ability to store runoff for a prolonged period, other effects such as deposition of suspended solids (including floatable trash and loose vegetation) and biochemical degradation of fertilizers, pesticides and biosolids is also possible. Detention structure design and application should be predicated upon a watershed analysis (model) whenever possible to achieve the maximum benefit to stormwater management.

### Design Criteria

Structural aspects of detention structures shall be as stipulated by applicable State requirements and are not regulated in this or other Standards. In the absence of such criteria Appendix A-10, Structural Guidelines for Detention Structures may be used. In Karst regions of the State, sufficient surface and subsurface investigations shall be conducted in order to identify the presence or absence of limestone within the reservoir and embankment area. Locations where sinkholes or solution channels are present or locations which have the potential for formation of these features, should be avoided. If alternate locations are not available, sealing or lining of the reservoir area may be required to prevent excessive seepage. See requirements under **Investigation, Design and Remedial Measures for Areas Underlain by Cavernous Limestone**, Appendix A10-19.

In addition it must be shown for the peak outflow as determined by the Modified Rational Method, USDA-NRCS Technical Release 55, Technical Release 20, USACOE - HEC HMS or other methods which produce similar results to these models, that there will be no soil erosion and sedimentation problems offsite. A detailed hydraulic analysis of the detention structure shall be submitted which will include an off site stability analysis pursuant to the Standard for Off-Site Stability, pg. 21-1. A completed Hydrologic Summary Form (Appendix A-2) shall be submitted to the district for each detention structure proposed.

### Design Storms

The peak discharge from the 2-year and 10-year frequency storm shall be analyzed. Frequency, duration and distribution shall be as defined in the USDA-NRCS Technical Release 55.

Design storm and volume may be determined by the Modified Rational Method on drainage structures up to 20 acres as described in Special Report 43 by the American Public Works Association, Practices in Detention of Urban Stormwater. This method is not recommended for analysis of sites with sensitive off-site areas. If there is an overall storm water management plan for the watershed that considers erosion, downstream peak flow increases that are compatible with the overall plan may be allowed. Note - more restrictive NJDEP stormwater management regulations may be applicable.

### Outlets for Conduits

Protection against scour at the discharge end of the spillway shall be provided in accordance with the Standard for Conduit Outlet Protection or by suitable hydraulic structures proven effective by properly documented research. Outlets discharging into structures shall also be designed in accordance with the Standard for Conduit Outlet Protection.

### Vegetation

The dam, emergency spillway, spoil, borrow areas and other disturbed areas above the crest of the principal spillway shall be vegetated in accordance with the Standard for Permanent Vegetative Cover for Soil Stabilization. All cut or fill slopes should be flat enough to accommodate the proposed operation and maintenance equipment.

### Safety

Detention structures attract children and can be very dangerous. Local, county or state regulations regarding health and safety must be adhered to.

This portion of the Standard is for guidance only.

### Ownership

Ownership and responsibility for operation and maintenance of the detention structure must be determined during design and shown on the plans and on the completed "Hydraulic and Hydrologic Data Base Summary Form" (Appendix A2). To be effective over a long period of time the structure must be properly maintained.

**This portion of the Standard is for guidance only.**

### Operation and Maintenance - General

A detailed schedule of operation and maintenance should be prepared for use by the owner or others responsible for the structure to insure that the structure functions properly. This schedule should provide requirements for at least annual inspection, operation, and maintenance of individual components, including outlets. It should be prepared during design and should specify who is responsible for maintenance. Additional requirements of the New Jersey Department of Environmental Protection may apply.

### Underground Facilities

Underground detention facilities shall be designed to prevent failure due to internal or external pressures including hydrostatic uplift pressure and imposed surface loads such as vehicles operated on or adjacent to the detention facility. Criteria for structural design are outside the scope of this standard. Structural design criteria must be based on sound and accepted engineering practices.

In acid or sulfidic soils, materials shall be non-reactive with the soil or measures shall be taken to protect the facility from the soil. Provisions shall be made to prevent debris from entering the facility. Debris collectors shall be placed so that the need for maintenance can be readily detected and cleaning operations easily performed. The bottom of the facility shall be on a slight grade to insure complete drainage. Access must be provided to the facility to permit removal of sediment and other debris

Soil Conservation Districts are responsible for the enforcement of operation and maintenance of stormwater management facilities during construction for the control of erosion and sedimentation only. Once a Final Certificate of Compliance has been issued by the district proper operation and maintenance becomes the responsibility of the entity designated on the plans and schedule.